

22056007

**BIOLOGY
HIGHER LEVEL
PAPER 1**

Wednesday 11 May 2005 (afternoon)

1 hour

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

1. What is an advantage of using an electron microscope?

- A. Living cells can be observed
- B. Virus particles can be observed
- C. Pigments can be observed
- D. Whole cells can be observed

2. Which observations support the Cell Theory?

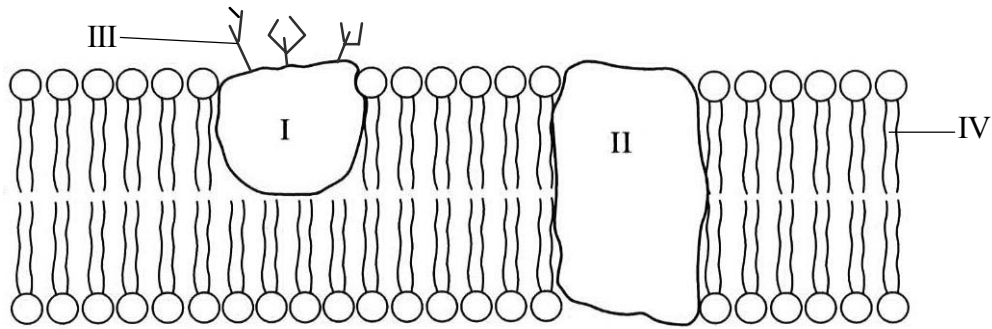
- I. Mature red blood cells do not contain a nucleus.
- II. Cells from a multicellular organism can be cultured in isolation.
- III. Muscle fibres contain many nuclei.
- IV. All cells develop from pre-existing cells.

- A. I and III only
- B. II and III only
- C. II and IV only
- D. III and IV only

3. A cell has a high density of rough endoplasmic reticulum (ER) in its cytoplasm. Which other organelle can be expected to occur in large numbers in this cell?

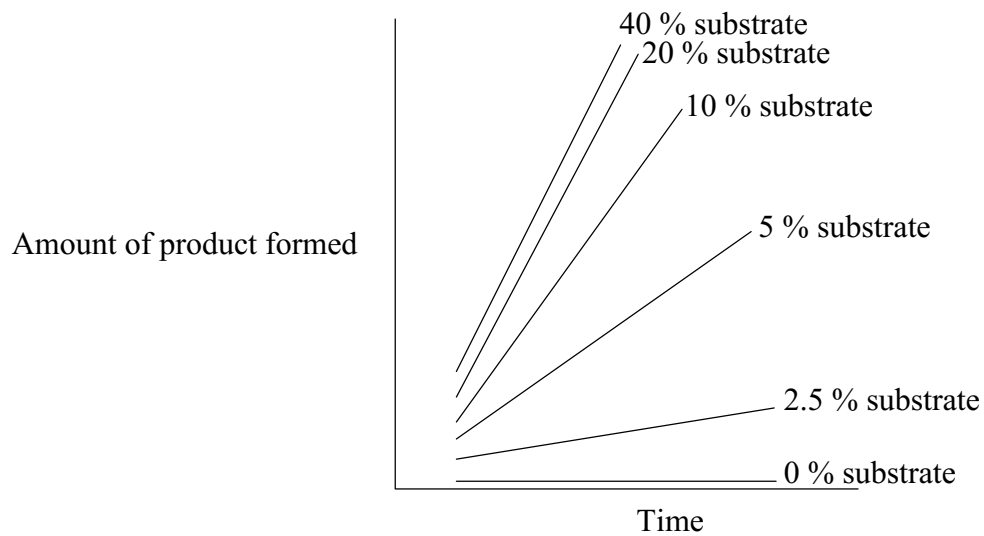
- A. Chloroplasts
- B. Microvilli
- C. Golgi apparatus
- D. Nuclei

4. What part of the plasma membrane is responsible for preventing the free movement of ions into and out of the cell?



- A. I
- B. II
- C. III
- D. IV
5. What is facilitated diffusion?
- A. The passive movement of a particle through the phospholipid bilayer of the cell membrane.
- B. The passive movement of a particle across a cell membrane via a channel protein.
- C. The movement of a particle down a concentration gradient helped by active pumping.
- D. The movement of a particle up a concentration gradient helped by active pumping.
6. How does mitosis produce two genetically identical nuclei?
- A. By separation of homologous pairs of chromosomes
- B. By separation of pairs of chromatids
- C. By division of the cytoplasm equally in two
- D. By division of the centrioles in two

7. The graph below shows the effect of changing the substrate concentration on an enzyme controlled reaction.



















What is the correct interpretation of these data?

- A. The rate of reaction increases continuously with increase in substrate concentration.
 - B. The rate of reaction decreases continuously with increase in substrate concentration.
 - C. The rate of reaction increases up to a point and then remains constant.
 - D. The rate of reaction is not affected by any change in the substrate concentration.
8. How does the enzyme pectinase help in fruit juice production?
- A. Pectinase increases the amount of protein in the juice extracted.
 - B. Pectinase decreases the lipid content of the juice extracted.
 - C. Pectinase increases the volume of the juice extracted.
 - D. Pectinase eliminates toxins from the juice extracted.

9. Which statement(s) about anaerobic cell respiration is/are correct?
- I. ATP is produced
 - II. Oxygen is required
 - III. Glucose is converted into pyruvate
- A. I only
- B. III only
- C. I and III only
- D. I, II and III
10. Pigments are extracted from the leaves of a green plant. White light is then passed through the solution of pigments. What effect do the leaf pigments have on the white light?
- A. Green wavelengths are absorbed and red and blue wavelengths are transmitted.
- B. Red and blue wavelengths are absorbed and green wavelengths are transmitted.
- C. Blue wavelengths are absorbed and green and red wavelengths are transmitted.
- D. Green and red wavelengths are absorbed and blue wavelengths are transmitted.
11. What causes Down's syndrome?
- A. Non-disjunction in the formation of sex cells
- B. Random alignment of chromosomes in the formation of sex cells
- C. Gene mutation in the formation of sex cells
- D. Crossing over in the formation of sex cells

12. Which combination of parents could produce children with any of the different ABO blood types?
- A × B
 - B × O
 - A × AB
 - A × A
13. What feature in a family pedigree chart would suggest that a trait is sex-linked?
- Numbers of offspring affected by the condition increased over several generations.
 - Girls only inherit the trait from their mothers.
 - Equal numbers of males and females show the trait.
 - One gender was more commonly affected than the other.
14. Police scientists, investigating the scene of a murder, found a drop of blood. The sample was analysed to produce a DNA profile. It was compared with the profiles of the victim and three suspects on an electrophoresis gel.

Blood Sample	Victim	Suspect 1	Suspect 2	Suspect 3
				
				
				
				
				

Which person does the blood sample match?

- The victim
- Suspect 1
- Suspect 2
- Suspect 3

15. What conditions exist when a population is in the plateau phase of population growth?

- A. immigration + emigration = natality + mortality
- B. natality + immigration = emigration + mortality
- C. mortality – immigration = natality – emigration
- D. immigration – natality = mortality – emigration

16. Which of the following taxa do *Milvus migrans* and *Milvus milvus* both belong to?

- I. Species
 - II. Order
 - III. Family
 - IV. Genus
- A. I only
 - B. IV only
 - C. I and III only
 - D. II, III and IV only

17. Which group of organisms, identified by this key, represents the Fungi?

- 1 Nuclei present 2
- No nuclei present A
- 2 Develops from an embryo 3
- Does not develop from an embryo 4
- 3 Cell wall present B
- No cell wall C
- 4 Cell wall of chitin D
- Cell wall of cellulose or no cell wall Protocista

18. In 1789 Gilbert White, a naturalist, observed eight breeding pairs of swifts (*Apus apus*) in the English village of Selborne. Each pair of swifts produces two offspring on average per year. In 200 years this should have produced 10^{30} swifts in the village of Selborne. A survey carried out in 1983 revealed only 12 breeding pairs in this village.

Which of the following possibilities could have prevented the numbers rising to 10^{30} ?

- I. The number of nesting sites remained the same
- II. The food supply of the swifts remained constant
- III. Predatory birds in the area were exterminated
- IV. The climate become colder from 1789 onwards

- A. I only
- B. I and II only
- C. I, II and III only
- D. I, II and IV only

19. What are the characteristics of the lipase used in digestion?

	Source	Optimum pH	Substrate
A.	Pancreas	8	Lipid
B.	Small intestine	8	Lipid
C.	Stomach	2	Sucrose
D.	Liver	8	Lipid

20. Which is the correct sequence of blood flow in normal human circulation?

- A. pulmonary vein → right atrium → aorta → vena cava
- B. vena cava → pulmonary vein → aorta → right atrium
- C. vena cava → right atrium → pulmonary vein → aorta
- D. pulmonary vein → vena cava → aorta → right atrium

21. How can human immunodeficiency virus (HIV) get transmitted from one human to another?

- I. By touching the skin of an infected person
- II. Through drinking contaminated water
- III. Through the exchange of body fluids
- IV. From mother to child across the placenta

- A. I and III only
- B. III and IV only
- C. I, III and IV only
- D. I, II, III and IV

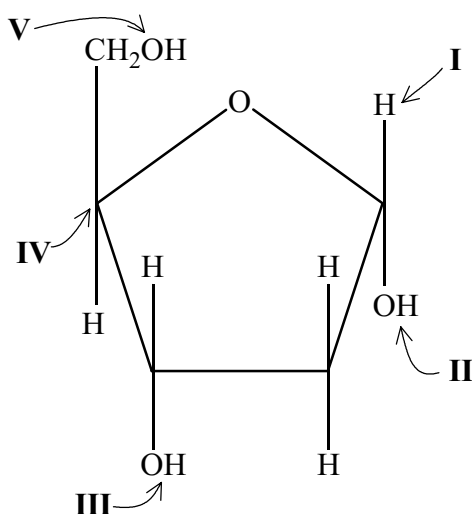
22. Which cells secrete insulin?

- A. β -cells of the pancreas
- B. Cells of the liver
- C. α -cells of the pancreas
- D. Epithelial cells of the intestine

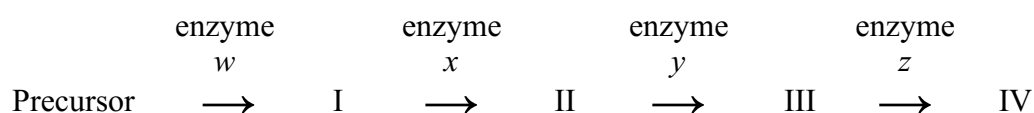
23. What does oxytocin control?

- A. Brain development of the fetus
- B. Onset of ovulation
- C. Stimulation of uterine contractions
- D. Implantation of the blastocyst

24. To which parts of the deoxyribose molecule do phosphates bind in DNA?



- A. I and V
- B. III and IV
- C. II and III
- D. III and V
25. The lac operon model of gene control in the bacterium *Escherichia coli* explains how the production of the enzyme β -galactosidase is controlled. Which conditions are necessary for β -galactosidase enzyme to be produced in this bacterium?
- A. Glucose is present and lactose is absent
- B. Glucose and lactose are present
- C. Glucose is absent and lactose is present
- D. Glucose and lactose are both absent
26. In the enzyme controlled pathway shown below, which compound is most likely to inhibit enzyme (w)?



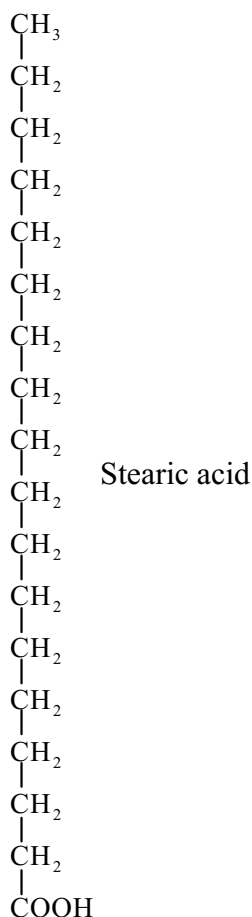
- A. I
- B. II
- C. III
- D. IV

27. Which of the following reactions take place in the Krebs cycle?

- I. NAD is reduced to $\text{NADH} + \text{H}^+$
- II. FAD is oxidized to FADH_2
- III. Pyruvate is converted to acetyl CoA (ethanoyl CoA)
- IV. ADP and inorganic phosphate is condensed to ATP

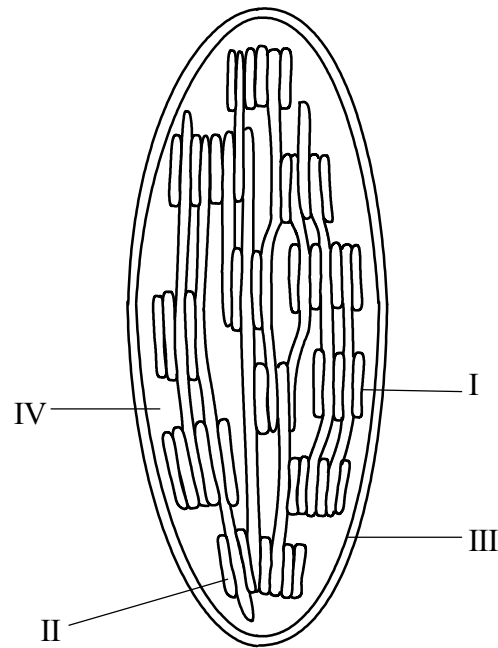
- A. I and II
- B. I and III
- C. III and IV
- D. I and IV

28. How many molecules of acetyl CoA (ethanoyl CoA) does the oxidation of the fatty acid stearic acid produce?



- A. 2
- B. 6
- C. 9
- D. 18

29. The diagram below shows a longitudinal section through a chloroplast.

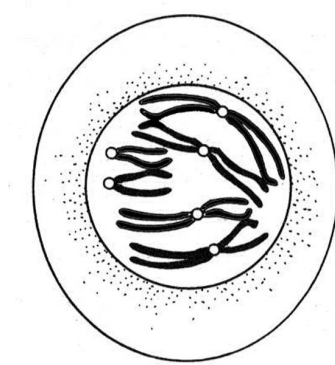


[Source: B Alberts, *et al.*, (1989) *The Cell*, Garland, page 367]

Where are the photosystems of the light dependent reaction located?

- A. I
- B. II
- C. III
- D. IV

30. The diagram below shows a cell in meiosis. What can be deduced from this diagram?



[Source: J W Saunders, (1968), *Animal Morphogenesis*, MacMillan, page 7]

	Stage of meiosis shown	Haploid number of chromosomes in this cell
A.	Metaphase I	6
B.	Prophase I	3
C.	Prophase I	6
D.	Metaphase I	3

31. Which condition is an example of a polygenic trait?

- A. Hemophilia
- B. Human skin colour
- C. Red-green colour blindness
- D. ABO blood grouping

32. Which of the following are functions of the placenta?

- I. Gas exchange
- II. Stimulation of uterine contractions
- III. Secretion of progesterone
- IV. Secretion of estrogens

- A. I only
- B. III and IV only
- C. I, III and IV only
- D. I, II, III and IV

33. A blood clot contains a network of protein. What is the protein?

- A. Fibrin
- B. Fibrinogen
- C. Hemoglobin
- D. Thrombin

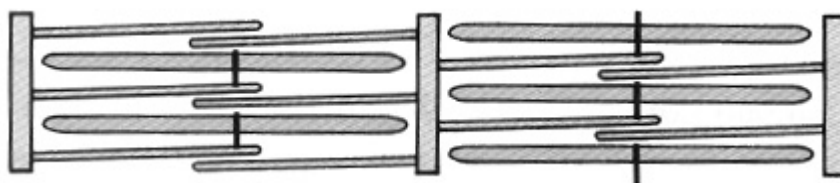
34. Monoclonal antibodies are produced by hybridoma cells. Hybridoma cells are formed by fusing tumor cells with another cell type. What is this cell type?

- A. Phagocytes
- B. B-cells
- C. Stem cells
- D. T-cells

35. In a nerve impulse, what happens at the site following the highest point of the action potential?

- A. Voltage-gated sodium ion channels open and Na^+ is pumped in.
- B. Voltage-gated sodium ion channels open and Na^+ diffuses out.
- C. Voltage-gated potassium ion channels open and K^+ is pumped out.
- D. Voltage-gated potassium ion channels open and K^+ diffuses out.

36. The diagram shows part of a muscle fibre. What will have occurred to bring the muscle fibre into this state?

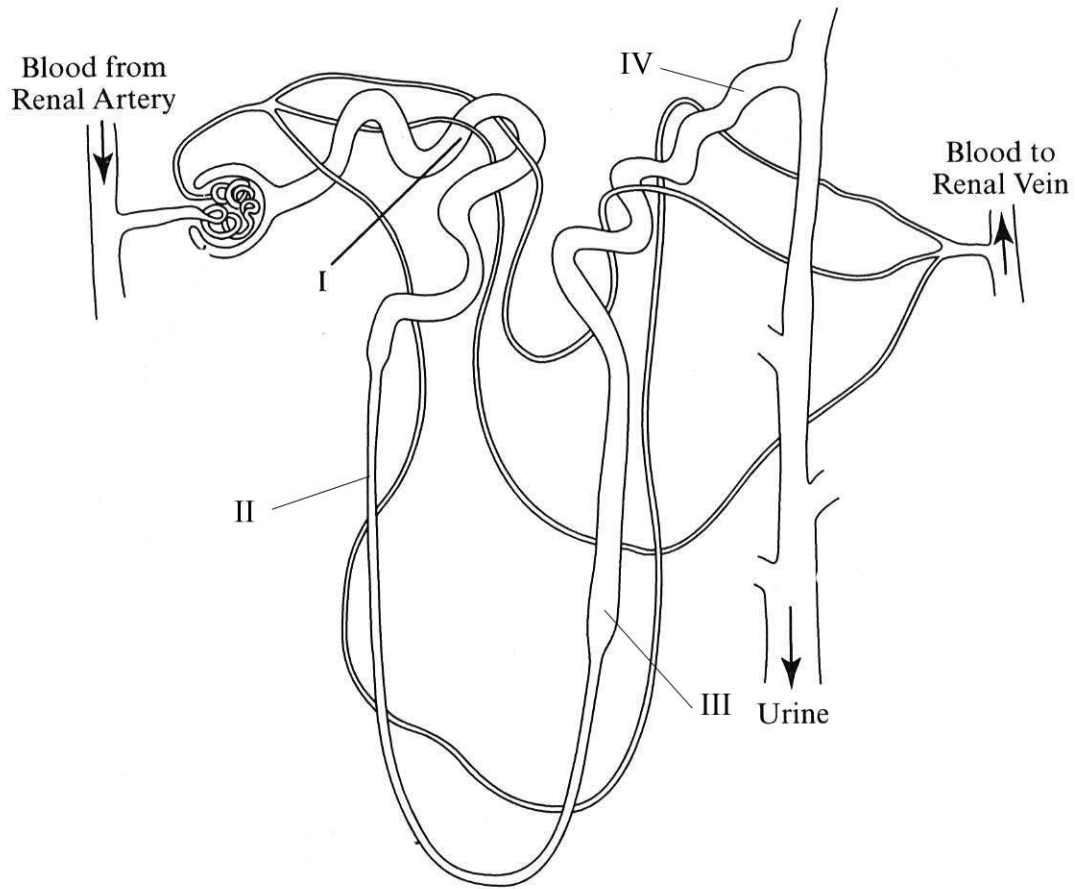


- A. The sarcoplasmic reticulum becomes polarized.
- B. Calcium ions move out of the sarcoplasmic reticulum.
- C. ADP and inorganic phosphate condense to form ATP.
- D. Troponin/tropomyosin protein complex blocks actin filament.

37. What is the relative toxicity of the following nitrogenous compounds?

- A. ammonia > uric acid > urea
- B. uric acid > urea > ammonia
- C. urea > uric acid > ammonia
- D. ammonia > urea > uric acid

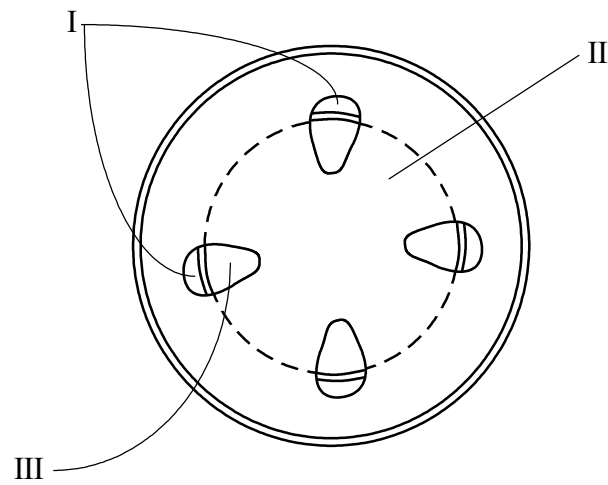
38. Which part of the nephron shown below is impermeable to water molecules?



- A. I
B. II
C. III
D. IV
39. Which of the following is a correct comparison of the bryophytes and the filicinophytes?

	Bryophytes	Filicinophytes
A.	Has a waxy cuticle	No waxy cuticle
B.	Has true leaves	Has scales
C.	Has rhizoids	Has roots
D.	Has woody tissue	No woody tissue

40. The diagram below shows a transverse section of a dicotyledon stem. Which part(s) is/are involved in carrying solutes up the stem?



- A. I only
 - B. II only
 - C. III only
 - D. I and III only
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